Anisotropy of magnetic susceptibility (AMS) as a proxy for seismic anisotropy: Evidence from the Pelona-Orocopia-Rand schist, southern California

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Our current interpretation of the composition and elastic properties of the middle and lower crust comes mainly from seismic observations. A more comprehensive understanding of the middle and lower crust will come from integrating results from multiple techniques that observe properties of crustal materials at depth. Such an approach requires that geophysical properties, including anisotropy, must be characterized for real Earth materials. This work combines measurements of anisotropy of magnetic susceptibility (AMS) and electron backscatter diffraction (EBSD)-based calculations of seismic anisotropy in samples of the Pelona-Orocopia-Rand (POR) schist from the Mojave region of southern California. The goals of this work are to characterize the: 1) relationship between seismic anisotropy and AMS, and 2) seismic anisotropy of the POR schist and its relationship to observed crustal anisotropy in the region.

Velocity anisotropy in individual samples of the POR schist ranges from ~2–11% in V_P and ~3–15% in V_S, which is consistent with results of Porter et al. (2011) for lower crustal anisotropy in southern California from analysis of receiver functions. When all schist samples are averaged together, the velocity anisotropy is significantly reduced to ~6% in V_P and ~8% in V_S. AMS results indicate a correlation between directions of maximum and minimum magnetic susceptibility and V_P (Figure 1). The magnitude of anisotropy in AMS does not show as strong a correlation with V_P, and may have a stronger dependence on magnetic mineralogy. These results indicate that AMS measurements may provide a proxy for maximum and minimum V_P directions.

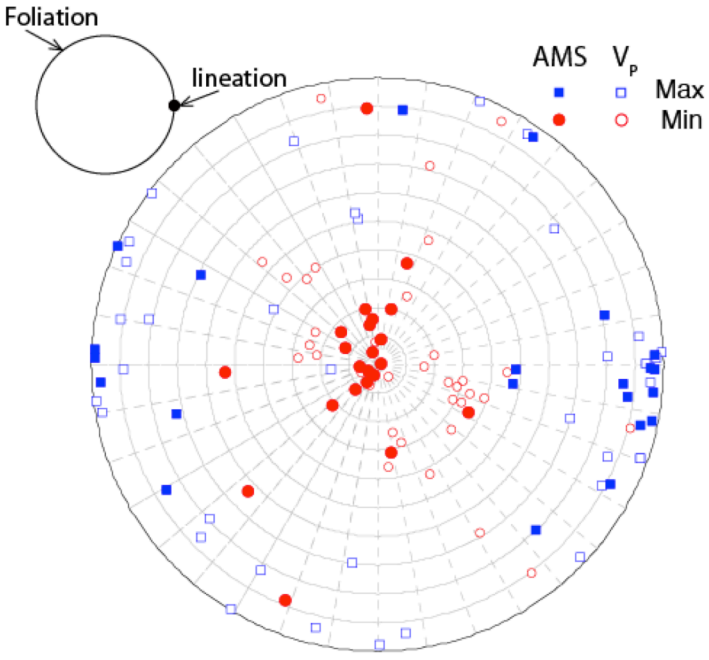

Figure 1. Maximum and minimum AMS directions (filled symbols) correlate with directions of maximum and minimum V_P (open symbols). Both properties have maxima within the foliation, ~parallel to lineation, and minima perpendicular to foliation. Equal area, lower hemisphere projection.

References cited: Porter et al. (2011): *Lithosphere*, **3**, 201-220.